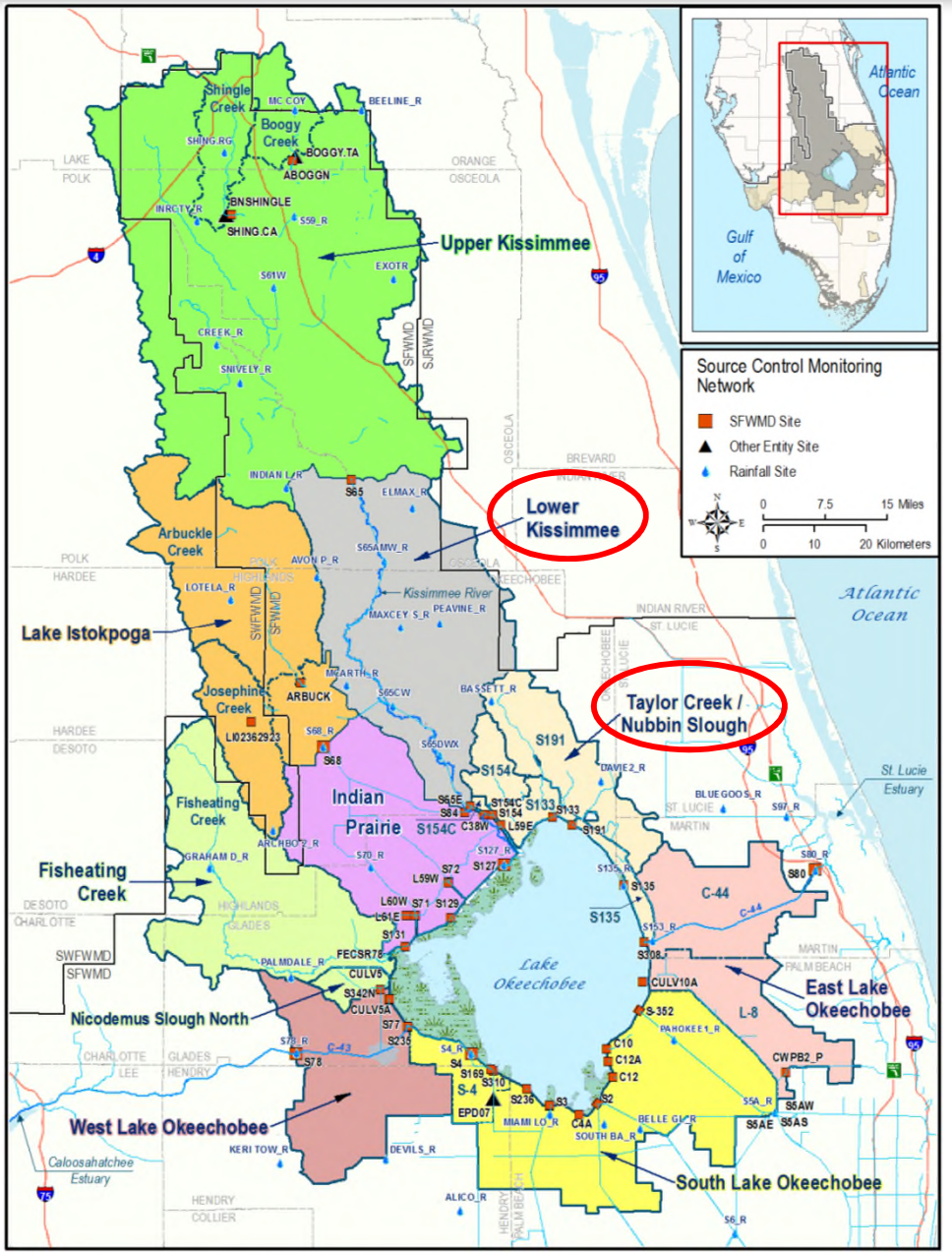
Successful Progress in Water Quality Management in the Lake Okeechobee Watershed

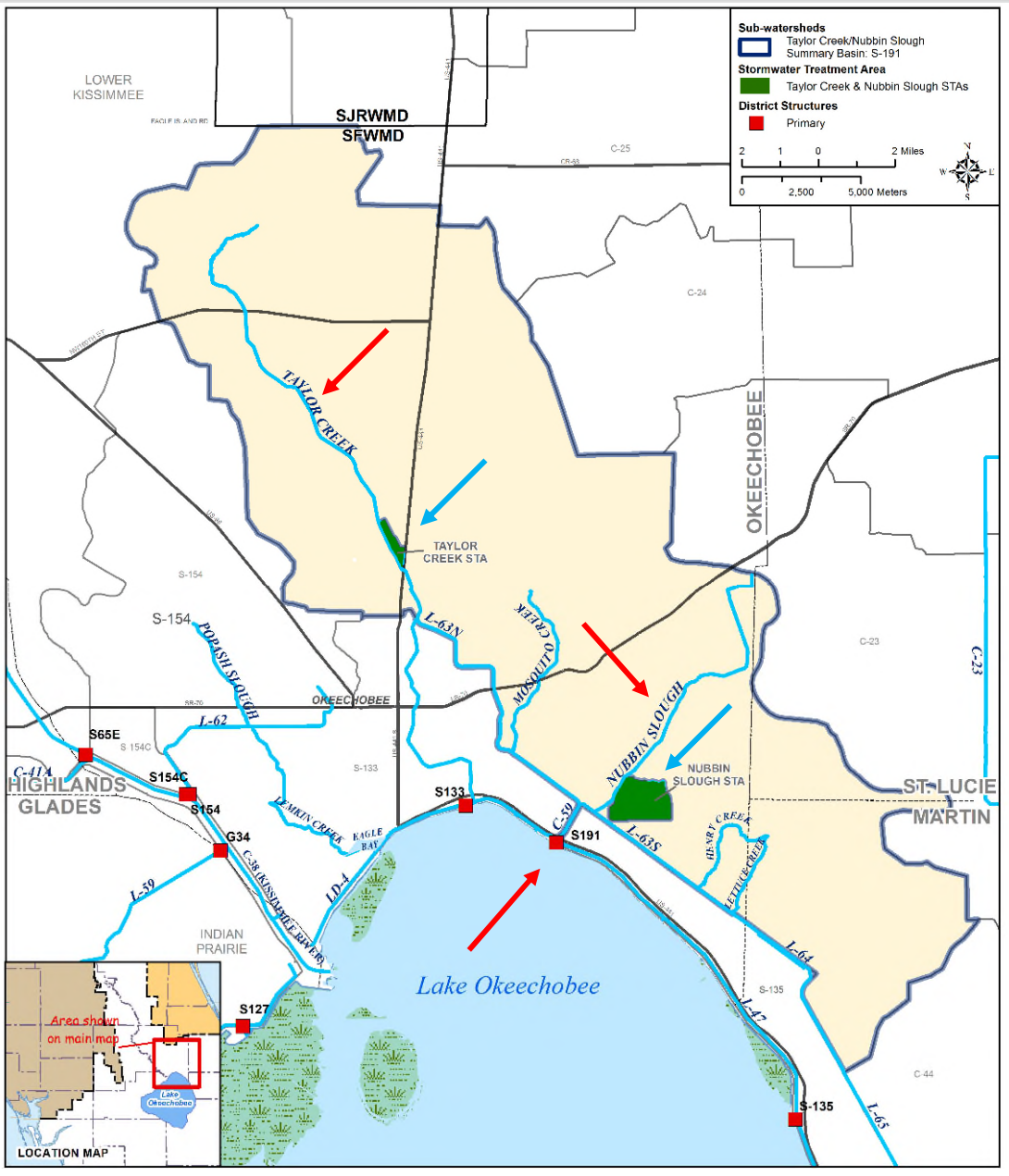
Jeff Iudicello, Ph.D., P.E.
Everglades Regulation Bureau
South Florida Water Management District

Introduction

- Water quality (WQ) in the Lake Okeechobee watershed (LOW) is vital to South Florida
  - An acknowledged regional issue since the 1970s
  - In 2001, TMDL of 140 mt Total Phosphorus (TP) was established
- The S-191 basin in the Taylor Creek Nubbin Slough (TCNS) subwatershed of the LOW was a large nutrient load producer
  - S-191 basin became the focus of many WQ programs
  - TP is nutrient of concern
- This presentation will:
  - Provide a brief history of the LOW and S-191 basin
  - Describe actions that were taken to improve WQ
  - Summarize current and future efforts to meet WQ goals

Lake Okeechobee Watershed





LOW History

- Historically, predominantly native pasture lands
- Land improvements from 1910s-1960s
  - Drainage canals and improved pastures
  - Increase in beef cattle: 20,000 animals in 1925 to 160,000 animals in 1950
  - Increase in improved pastures: 84,000 ac in 1950 to 420,000 ac in 1970
- 1950-1960s: Major influx of dairies from Miami into LK & TCNS
  - Increase in milking cows: 6,000 in 1950 to 48,000 in 1969

Water Quality Issues

- Result of land use and land use change:
  - Greatly increased TP content in LOW
  - Via feed, fertilizer, manure, etc.
- Late 1960s- public awareness of environmental effects
  - Increased eutrophication and environmental degradation observed in and around Lake Okeechobee
  - Accelerated by nearly 2 decades of intensified land use
  - No WQ standards had ever been developed or enforced

US & FL Agency Actions

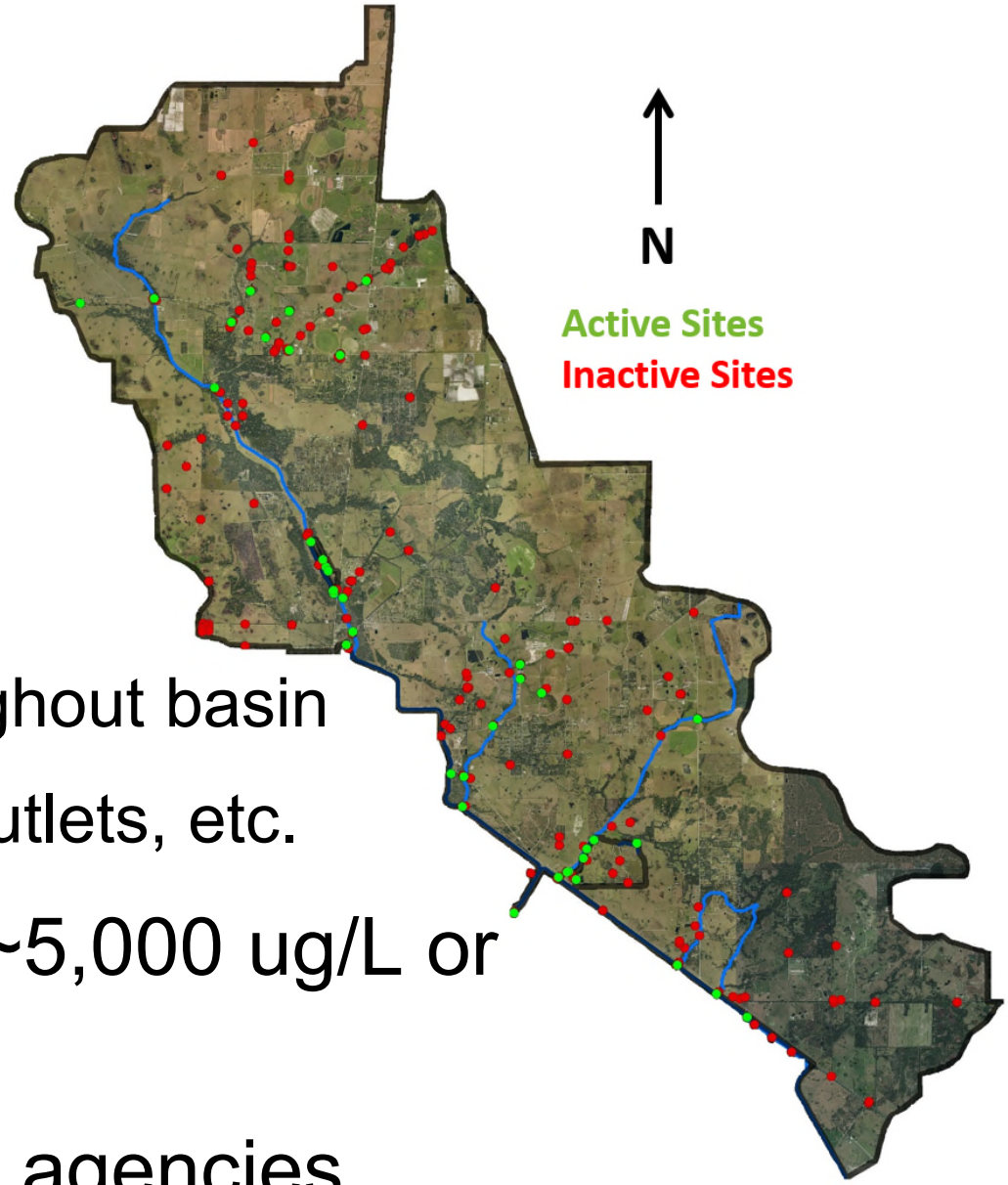
- FL Water Management Districts (WMD) created in 1972
  - Primary mission: flood control, water supply, water quality
- US Rural Clean Waters Program
  - In July 1981, TCNS was selected as 1 of 21 federally funded programs to reduce nonpoint source pollution in rural watersheds
- Dairy Rule (FDEP), 1987
  - Required collection and treatment systems for wastewater and runoff, i.e. lagoons, retention ponds, etc.
- Dairy Buyout Program (SFWMD & FDACS) , 1987-1992
  - 18 out of 48 dairies were bought out in LK & TCNS, reduced herds from 54,000 to 33,000 milk cows from 1987 to 1992
- Works of the District Rule (SFWMD), 1989
  - TP concentration standard for property discharges

Other Agency Efforts

- FDACS Agricultural Nutrient Management Plan for Priority Basin Dairies (2002)
- FDACS Best Management Practice (BMP) Rule for Lake Okeechobee Priority Basins (2003)
- FDEP Dairy Rule becomes part of concentrated animal feeding operation permitting program (2004)
- Former Dairy Remediation Projects (2004-2008)

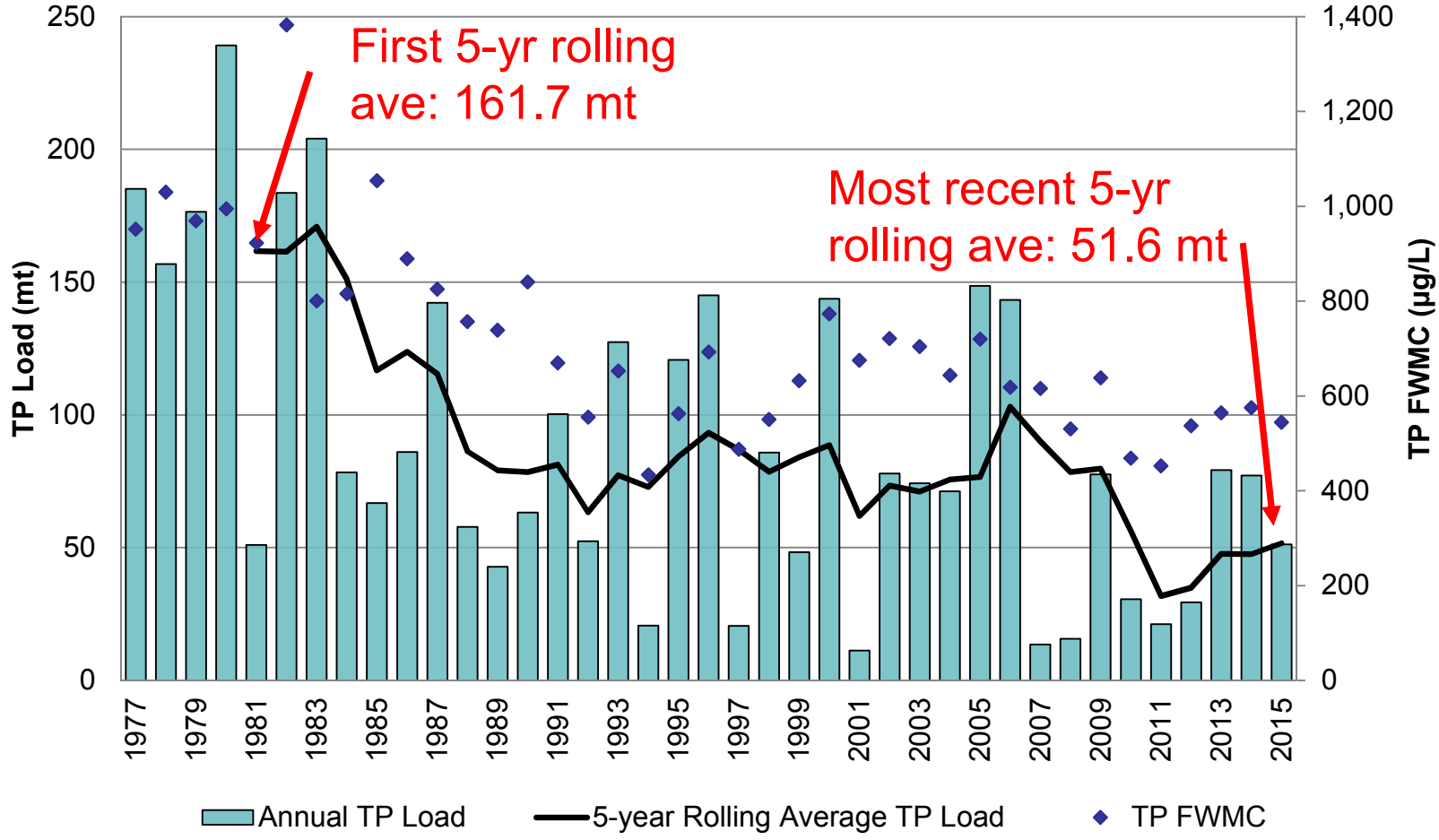
S-191 Monitoring Network

Land Use	2008–2009
Natural Area	13%
Improved Pasture	57%
Unimproved Pasture	6%
Citrus	2%
Tree Plantation	0%
Row Crops	0%
Dairies	3%
Urban	5%
Others	14%



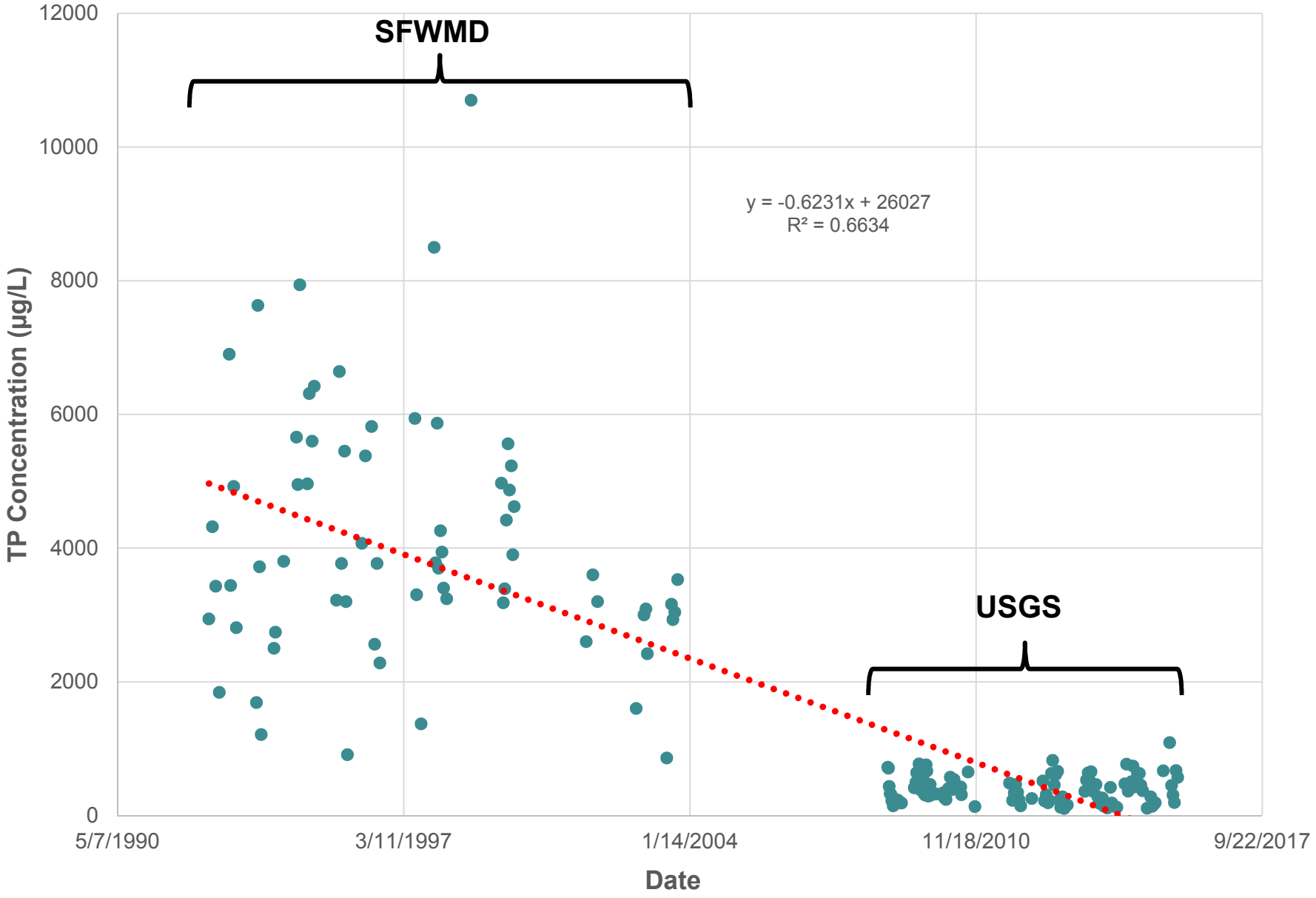
- WQ sampling programs
  - Track long-term trends throughout basin
  - Upstream tributaries, basin outlets, etc.
- Early annual TP averages ~5,000 ug/L or more at some sites
- Monitoring funded by many agencies

Long-Term S-191 Basin TP Trend



- Load calculated at structure S-191 before entering Lake Okeechobee
- Long-term trend is reduced TP loads

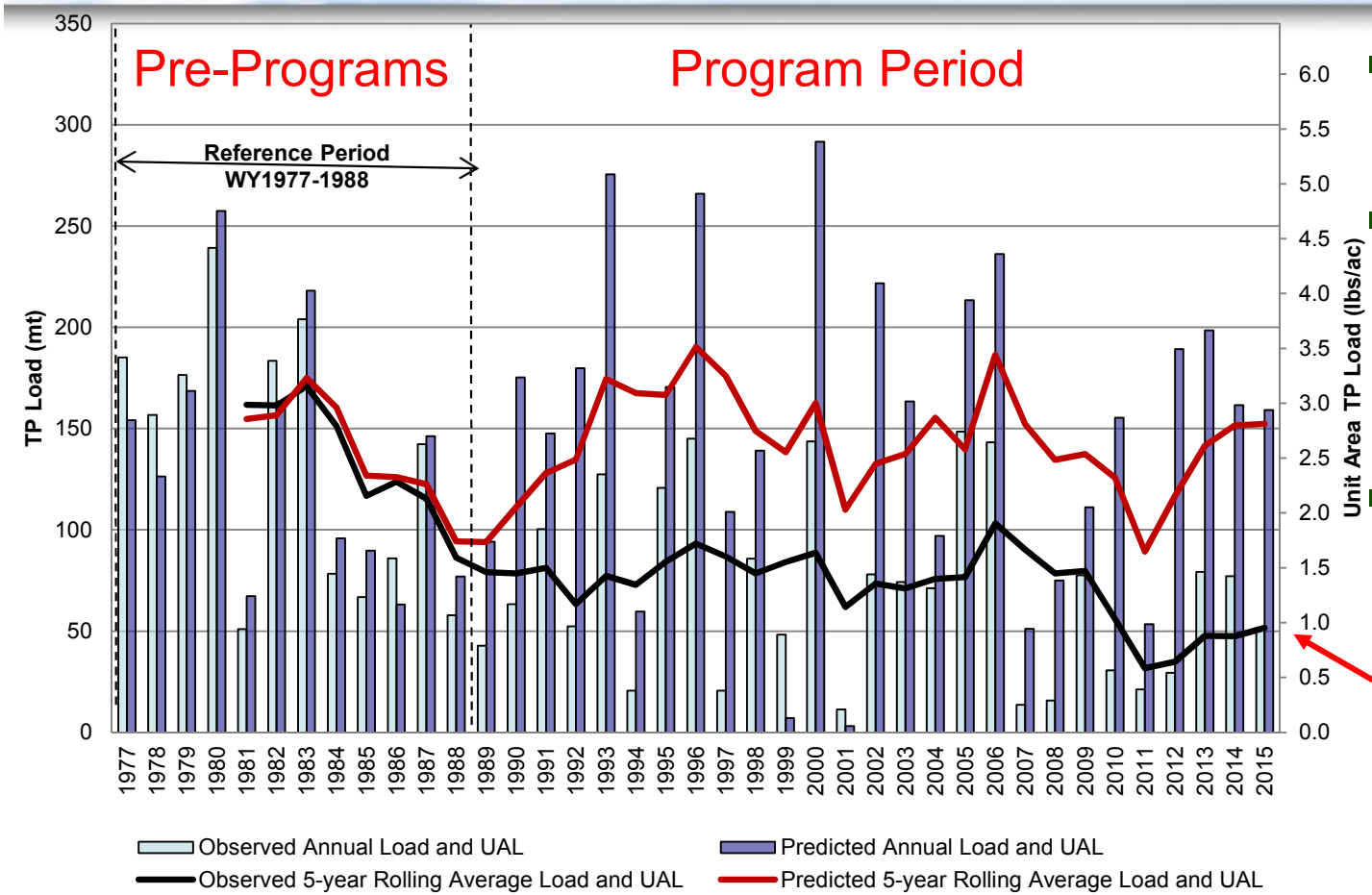
Example: Site 02275197



Examples of BMPs

- Dairies
  - Relocate high density cow areas far from streams
  - Dispose wastewater on crop lands
- Pastures
  - Install fencing to minimize cattle access to streams
  - Reduce fertilizer application
- Crops
  - Control nutrient application
  - Reduce sediment in runoff

S-191: Observed vs. Calculated Results

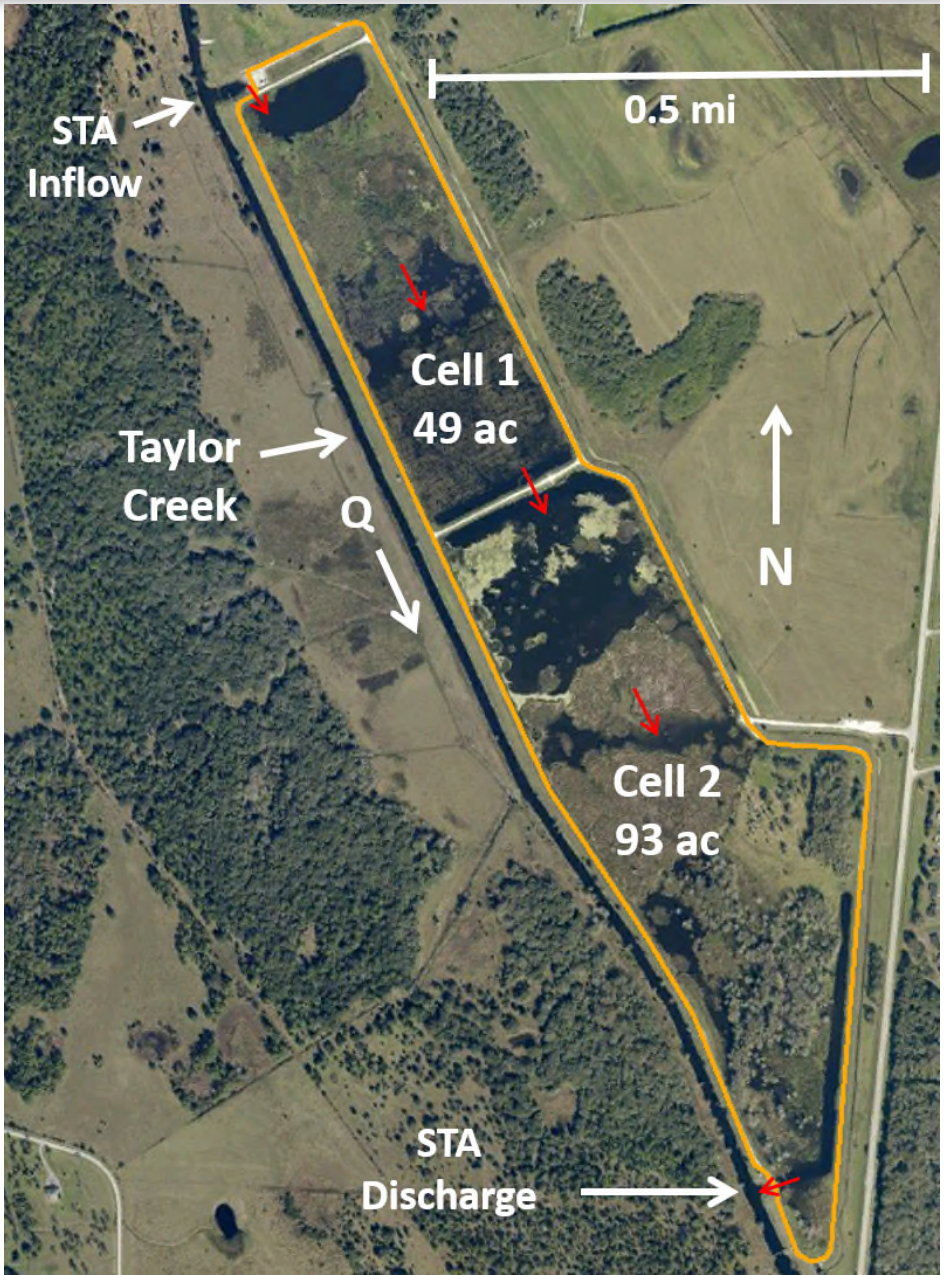


- A reference period was established
- Calculations based on reference period but adjusted for hydrologic variability
- Performance after reference period shows effects of programs

- Good news: Programs work!
  - Positive results achieved almost immediately, especially with BMPs
- Bad news: BMPs alone can not achieve the desired reduction
  - 2001 Lake Okeechobee TMDL target = 105 mt TP from runoff
  - More programs and projects are needed to attain WQ goals

Taylor Creek Stormwater Treatment Area (STA)

- Pilot project on Taylor Creek
- 142 ac treatment area
- Operations began Jun. 2008
- Long-term TP removal design rate of ~ 2 mt/yr
  - Approx. 9% of TP load in TC
- Notes:
  - This STA is relatively small compared to stream size
  - Was offline in 2010 for construction repairs



Summary

- Through the 1900s the LOW experienced large nutrient increases.
- Programs and projects were initiated to help improve runoff WQ in basins of the LOW.
- The S-191 basin is a case study of how positive WQ trends can be realized.
- WQ improvement is a result of many projects, programs, and agencies.
- Major WQ improvement has been made, but there is still more to do to achieve WQ goals.
  - More STAs, storage reservoirs, BMP research

Thank You.

Questions?

Jeff Iudicello, Ph.D., P.E.
Staff Engineer, Everglades Regulation Bureau
South Florida Water Management District
jiudicel@sfwmd.gov
561-682-2913
www.sfwmd.gov/sourcecontrols